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Descriptors-*Annotated Bibliographies, Audiovisual Aids, Audiovisual Instruction, Bibliographies, Computer Assisted Instruction, *Curriculum Guides, Educational Objectives, Evaluation Techniques, Film Production Specialists, Graphic Arts, Instructional Design, Instructional Materials, *Instructional Media, *Instructional Technology, Learning Characteristics, Learning Theories, *Media Research, Multimedia Instruction, Perception, Program Evaluation, Televised Instruction

Organization of this graduate course of study in educational media research and theory consists primarily of developing a course outline, providing a single objective and some teaching suggestions and approaches for each unit, and gathering an extensive bibliography (with specific reference to the most recent and the most useful sources). Unit 1 presents an overview of the literature. Unit 2 considers the psychology of learning, perception, physiology, and communication process and information theory. Unit 3, Media Characteristics and Effects, studies the specific characteristics that different media hold jointly or uniquely. The fourth unit, Message Design and Production, deals with preproduction testing and evaluation, motion and audio relevance, repetition, active student response, directed attention and response guidance, and technical production factors. The fifth unit, titled Media Relationships to Instructional Objectives and Subject Matter, and the sixth unit, Media Relationships to Learner Characteristics, indicate directions for much needed research. The final unit, Conditions of Instructional Media Use, applies educational media to practical situations. Class development of a synthesis and taxonomy is encouraged. (MM)

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The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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INTRODUCTION

This course of study and bibliography in educational media research and theory is presented as a suggested guide for the teaching of a graduate course in educational media. It is divided into seven sections, each consisting of a detailed bibliography of readings and an outline of content that might be taught using the readings.

Because there is no best way to organize a graduate course in educational media research and theory and because each instructor of such a course will have his own ideas how such a course should be taught, no rigid outline is given of topics to be covered. Rather, the extensive bibliography, classified into seven major topics, serves as the nucleus around which the suggested content is arranged. The bibliography may be used by the instructor and selected references extracted from it to form a selected bibliography of the instructor's own composition, or it may be duplicated in its entirety and made available to the students. In any event, an attempt has been made to make the bibliography as representative as possible and to suggest ways it might be used to teach various topics.

UNIT ONE

THE LITERATURE OF EDUCATIONAL MEDIA RESEARCH AND THEORY

A. Objective:

1. The major purpose of this introductory unit to the course of study is the presentation of an overall survey of the literature of educational media research and theory. This purpose will be accomplished by reviewing the principal journals, books, and references in the field and determining the specific contributions that each makes to educational media research and theory.

B. Content to be Taught:

1. A large body of literature relating to educational media research and theory is in existence, and the major references are listed in the accompanying bibliography. The following observations about the literature itself may be made:
   a. The most useful and recent systematic reviews of the research are those by Allen (B.1.),* Campeau (B.3.), Hoban and van Ormer (B.16.), Lumsdaine (B.17.), and Lumsdaine and May (B.18.).

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*Reference numbers indicate the citations in the Bibliography at the end of each unit.

b. Duke (B.10.) has reviewed and abstracted media research conducted in the Far East, and Harrison (B.14. and B.15.) has done the same for media research conducted in Europe.

c. Reviews of the more recent research appear about every three years in the Review of Educational Research. These reviews are listed in the Bibliography under the names of Estvan (B.11.), Finn and Allen (B.12.), and Torkelson (B.26.).

d. The publication by Reid and MacLennan (B.24.) contains useful abstracts of 333 television and film research studies and an introductory review of the trends in research on instructional television and film prepared by Leslie P. Greenhill.

e. Section C of the Bibliography lists a number of compilations of research studies and papers, the main characteristics of which are as follows:

   (1) Books of readings drawn from the educational media literature were compiled by Allen (C.1.), Knirk and Childs (C.14.), Lumsdaine and Glaser (C.17.), Miles (C.19.) and Weisgerber (C.24.).

   (2) The two volumes by Carpenter (C.3. and C.4.) comprise the research output of the U.S. Navy's Instructional Film Research Program at Pennsylvania State University immediately following World War II; the Gibson report (C.9.) presents studies on the use of motion pictures for testing; the Hovland, Lumsdaine and Sheffield book

(C.13.) is devoted primarily to the World War II studies of indoctrination films; and Lumsdaine's Student Response in Programmed Instruction (C.16.) contains a number of detailed research reports and theoretical papers, most of which were conducted for the Research and Development Command of the U.S. Air Force, concerned with the experimental study of procedures for buiding the responses of learners in order to increase the effectiveness of instruction.

(3) The Freeman book (C.7.) contains the reports of the first systematic program of audiovisual research (often referred to as the Commonwealth Fund studies) conducted in this country. More recent compilations of research studies are included in May and Lumsdaine (C.18.) and Travers and Others (C.22.).

(4) A large selection of theoretical and descriptive papers relating to research and theory are included in the other references in Section C of the Bibliography.

f. Section D of the Bibliography contains critical analyses of educational media research. The two Lumsdaine references (D.6. and D.7.) in particular deal with methodological problems in the conduct of educational media research.

2. A number of professional educational journals devote all or some of their pages to a consideration of educational media research and theory. The following observations about the journals may be made:

a. The principal theoretical and research journal is AV Communication Review, issued quarterly since 1953 as an official publication of the Department of Audiovisual Instruction, and publishing the bulk of the theoretical media material in print.

b. Occasional theoretical and research articles appear in the more widely circulated audiovisual publications and in the more general educational journals, such as AV Instruction, Harvard Educational Review, Teachers College Record, and Phi Delta Kappan.

c. The journals of the American Psychological Association frequently publish papers having implications for the educational media field, and the Journal of Educational Psychology, in particular, often contains research papers relating to educational media.

d. The Review of Educational Research publishes an issue every three years on the subject of instructional technology, and the American Educational Research Journal contains frequent papers on educational media.

3. The following special sources of information on educational media research deserve mention:

a. The ERIC Clearinghouse on Educational Media and Technology at the Institute for Communication Research, Stanford University, Stanford, California, is supported by the U.S. Office of Education and is charged with collecting, organizing, and making available resource information in the audiovisual communication area. A newsletter and brochures describing the ERIC system are available from the Stanford Clearinghouse. Research reports and other documents are classified and listed in Research in Education, published by the U.S. Government Printing Office, Washington, D.C. Such documents are available from the ERIC Document Reproduction either in microfiche or hardcopy form. Starting in the Spring 1969 issue of AV Communication Review ERIC at Stanford is abstracting a selection of media research reports and papers.

b. Under the provisions of Title VII of the National Defense Education Act of 1958 a number of media research studies have been conducted. These studies, totalling in the hundreds, are generally available only through the ERIC Clearinghouses, as described in the paragraph above, or in limited quantities from the authors. However, a total of almost 300 of the studies were abstracted in 15 installments in AV Communication Review, beginning in the July-August 1961 issue and extending through the Fall 1967 issue. In addition to these NDEA abstracts, AV Communication Review has, in almost every issue, printed abstracts of the research literature. These abstracts number in the hundreds, and, together with the NDEA abstracts and ERIC at Stanford listings, serve as a ready reference to the past and more recent educational media research.

C. Teaching Suggestions and Approaches:

1. Although the instructor may wish to present an overview of the literature, there is no substitute for actual student familiarization with the specific documents. This assumes their availability in the library.

2. A possible organization for this section of the course might be the following:

   a. Introducing the literature.

   b. Furnishing each student with a copy of the Bibliography.

   c. Reading assignments from Section A of the Bibliography to obtain a general overview of the field. Of particular importance are the readings from Lumsdaine (A.5. and A.6.).

   d. Surveying the research summaries in order to get a general familiarity with the broad structure of the research with media. The most useful general surveys are those by Allen (B.1.), Campeau (B.3.), Finn and Allen (B.12.), Hoban and van Ormer (B.16.), Lumsdaine (B.17.), Lumsdaine and May (B.18.), Miller and Others (B.20.), Greenhill's introduction in Reid and MacLennan (B.24.), and Torkelson (B.26.).

   e. Making a critical analysis of the state of the art of educational media research. Lesser and Schueler (D.5.), Lumsdaine (D.6.), and MacLean (D.8.), point out some of the methodological problems in media research. Hoban (D.3.) and Meierhenry (D.9.) suggest some needed directions for future research.

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UNIT TWO

THE BASIC FOUNDATIONS

A. Objective:

1. The major objective of this instructional unit is the development of knowledge about the basic foundations upon which a science of educational media may be built. This will be accomplished through selected readings, discussion, and assignments.

B. Content to be Taught:

1. The basic foundations upon which educational media production and use are built will be outlined below:

   a. Psychology of Learning Foundations:

      (1) There is a long tradition of research on learning, and from this activity many theories of learning have evolved. Although the actual usefulness of these theories in developing a science of instruction has been questioned (B.15., B.16., B.28.), they deserve some attention as they relate to teaching with educational media. A number of the bibliographic references have direct implications to this question. For example, an entire issue of AV Communication Review edited by Meierhenry (B.40.) was devoted to a discus-

sion of the relationship of learning theory to audiovisual utilization. Also dealing with this question were Carpenter (B.8.), Hartman (B.25.), Hilgard (B.26. and B.28.), Kendler, Kendler and Cook (B.31.), May (B.39.), and Snygg (B.50.).

(2) The identification of more practical psychological guidelines to use in designing and using educational media have been made by Carpenter (B.9. and B.10.), Edling (B.12.), Gagné (B.20.), Glaser (B.22., B.23., and B.24.), Lumsdaine (B.34.), Miller and Others (B.40.), Norberg (B.42.), and Stolurow (B.51.).

(3) Careful theoretical attention has been given to the sequencing and ordering of instructional tasks by Briggs (B.3.) and Sheffield (B.47.).

b. Perceptual Foundations:

(1) The need for an understanding of the perceptual base of educational media use is apparent, yet it has been largely ignored by media specialists. Several of the bibliographic references have direct implications for the understanding of the perceptual foundations. An entire issue of AV Communication Review, edited by Norberg (C.27.) was devoted to a discussion of the relationships of perception theory to audiovisual education. Also dealing with this question were Gibson (C.15.), McFee (C.24.), Mialaret (C.25.),

Norberg (C.26. and C.28.), Taylor (C.34.), and Travers (C.37.).

(2) Several basic theoretical references present a more fundamental view of the perceptual foundations. Of particular importance are Eleanor Gibson (C.13.), James J. Gibson (C.14.), the book of readings edited by Haber (C.20.), Travers (C.37.), and Vernon (C.38., C.39., and C.40.).

(3) Considering the characteristics of eye movements in the visual perception of still and moving objects were Brandt (C.4.), Buswell (C.7.), and Guba (C.18. and C.19.).

(4) The perceptual aspects of artistic representations were discussed by Arnheim (C.2.), Bernheimer (C.3.), and Kepes (C.22.).

c. Physiological Foundations:

(1) Little direct attention has been given by media specialists to the physiological foundations for a system of audiovisual application. Travers' (D.4.) discussion of the mechanics of the transmission of information in the central nervous system is probably the most directly applicable even though it is strongly biased toward the Broadbent single-channel capacity point of view.

(2) The other general references in the Bibliography are useful in providing a background about physiological functions.

d. The Communication Process and Information Theory:

(1) Although the communication process and information theory have been given but scant attention by instructional media specialists in the past and have been considered to be more the concern of mass media communicators, they have many implications for both the design and use of instructional media. An overall view of the characteristics of the communication process and information theory was presented by Adams (E.1.), Baldwin (E.3.), Dance (E.11.), Fearing (E.12.), Harrison (E.15.), Harwood and Cartier (E.16.), Knowlton (E.19.), Schramm (E.33.), Thayer (E.35.), and Travers (E.36.).

(2) A variety of human communication models have been presented by Bettinghaus (E.5., E.6., and E.7.), Gerbner (E.13. and E.14.), Kent (E.17.), Shannon and Weaver (E.34.), and Westley and MacLean (E.37.).

(3) Dealing directly with information theory and its characteristics were Attneave (E.2.), Miller (E.24. and E.25.), and Quastler (E.28.).

(4) The question of channel capacity, which has some direct implications for the design of instructional materials, was treated by Miller (E.25.), Quastler (E.29.), and Travers (E.36.).

e. Aesthetic Foundations:

(1) The aesthetic factors pertain more to artistic repre-

sentation and instructional materials design than to the selection and utilization aspects of educational media. In this regard, the chapters on "Form" and "Movement" in Arnheim (F.2.), selections from Kepes (F.5.), Langer (F.6.), and Taylor (F.8.) may be read with profit.

f. Historical Foundations:

(1) The primary discussion of the history of educational media was written by Paul Saettler and is most available in his book (G.7.).

g. Sociological Foundations:

(1) The broad relationships of the educational and mass media to society are best understood from a reading of Becker (H.1.), Biddle and Rossi (H.2.), Fearing (H.4.), Henry (H.7.), and Riley and Riley (H.13.).

(2) The innovative and acceptance aspects of the media by educators was presented by Eichholz and Rogers (H.3.), Janowitz and Street (H.8.), Knowlton (H.9.), Meierhenry (H.11.), and Wolcott (H.14.).

h. Technological Foundations:

(1) The major discussion of the implications of technology for education was presented by James D. Finn in a series of papers (I.3., I.4., I.5., I.6., and I.7.). Other papers, originating from the NEA Technological Development Project at the University of Southern California (I.1., I.2., I.11., and I.17.) treated

additional aspects of technological development. Saettler (I.19. and I.20.) has treated the history of this development in a systematic form.

(2) Marshall McLuhan's controversial opinions about the relationships of the technological developments of communications and society were presented in three principal publications (I.13., I.14., and I.15.).

j. Definition of the Educational Media Field:

(1) Attempts have been made recently to define the scope of the educational media field. These attempts have ranged from the construction of a set of technical standards to theoretical constructs for the entire field.

(2) The nature of the media specialist and his duties has been discussed by Bern (J.1.), Brown (J.2.), Eboch (J.3.), and Morris (J.11.).

(3) The education and training of the media specialist has been set forth by Harcleroad (J.7.), Larson (J.9.), and Stone (J.13).

(4) Meierhenry (J.10.) edited a book of papers that dealt with the media competencies needed by teachers to perform their roles effectively.

(5) Considering fundamental aspects of the professionalization of the media field were Ely (J.4.), Finn (J.5. and J.6.), and Knowlton (J.8.).

C. Teaching Suggestions and Approaches:

1. Knowledge of the basic foundations treated in this section of the course are generally not too well known by most instructors. Thus, the instructor preparation for teaching this unit will probably be greater than for the other units, and the instructor will need to do a considerable amount of personal reading.

2. A possible organization for this section of the course might be the following:

    a. Introduction of the section and assignment of basic general readings. Depending upon the instructor's approach and the textbook(s) he uses (if any), he may wish to assign readings from Section A of the Bibliography. Any four or all four of the following books might serve as an introduction to the Basic Foundations and/or as a nucleus around which the instruction is organized: Paul Saettler's A History of Instructional Technology (A.7.), Karl and Margaret Smith's Cybernetic Principles of Learning and Educational Design (A.8.), Robert Travers' Research and Theory Related to Audiovisual Information Transmission, and Raymond Wiman and Wesley Meierhenry's Educational Media: Theory Into Practice.

    b. The instructor will probably make a selection of the Basic Foundation areas to emphasize. Certainly, the "Psychology of Learning Foundations" and the "Perceptual Foundations" are the most critical and probably deserve the greatest instructional emphasis. The instructor may wish to follow the organization given in Sections B.1.a. and B.1.b. above in teaching these topics.

c. If the instructor wishes to treat the various communication models, the best single compilation of the graphic depiction of the models is in John Ball and Francis Byrnes' Research, Principles, and Practices in Visual Communication (E.4.).

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UNIT THREE

MEDIA CHARACTERISTICS AND EFFECTS

A. Objective:

1. The major objective of this instructional unit is the establishment of knowledge about the characteristics of the different instructional media. The characteristics of media in general will be considered and then the unique characteristics of different types of media.

B. Content to be Taught:

1. The tendency to treat all instructional media as a single class in a concrete-abstract dichotomy has resulted in the masking of the specific characteristics that different media hold jointly and/or uniquely.

2. General Characteristics of Media:

   a. A fundamental prerequisite for understanding the nature of the different media of instruction is the development of a taxonomy or classification system that will provide some systematic descriptive criteria. Preliminary attempts toward evolving such a taxonomy have been made by Allen (A.1.), Fattu (A.6.), Gagné (A.7.), Gerlach (A.8.), Meredith (A.25.), and Parker and Downs (A.26.).

b. Extensive review of the research pertaining to the effects of different media, used either singly or in combination, were made by Day and Beach (A.5.), Hartman (A.15.), and Hsia (A.16.). The Hartman and Hsia reviews are readily available and comprise the most complete compilation of research studies and bibliographies bearing on this subject.

c. More specific discussion of single and multiple channel effects were given by Anderson (A.2.), Conway (A.3, and A.4.), Hartman (A.14.), Severin (A.30., A.31., and A.32.), Travers (A.34.), and Van Mondfrans and Travers (A.36.).

d. The role played by visuals in instruction has been extensively treated by Gropper (A.9., A.10., A.11., A.12., and A.13.), and strategies of media use have been suggested. May's (A.22.) working paper on word-picture relationships in audiovisual presentations presented an excellent overview of the research and makes generalizations of value to the media specialist and producer. Research by Lumsdaine (A.19.) and May and Lumsdaine (A.24.) considered specific aspects of the word-picture relationships.

3. Characteristics of Still Pictures:

a. A knowledge of the characteristics of still pictures is fundamental to an understanding of instructional media. Thus, an extensive bibliography of references related directly to still picture representation is given.

b. Overall reviews of research on different aspects of still picture use and characteristics were made by Allen (B.1.), Saul and Others (B.23.), the University of Illinois (B.34.), and Wendt and Butts (B.36.).

c. Brandt (B.3.) and Buswell (B.4.) studied the movement of the eyes as an observer looked at still pictures and drew conclusions about the picture-movement relationships. Guba and his associates also studied this problem with television, and the results are cited in bibliographic references to television (D.16. and D.17.).

d. The most extensive work with still pictures has been made in connection and the picture-print relationships. Particular attention was given to this problem by Cooney (B.5.), Fleming (B.9., B.10., B.11., and B.12.), Ibison (B.15.), MacLean and Kao (B.17.), McKendry, Snyder and Gates (B.18.), Smith (B.25., B.26., and B.27.), and Spaulding (B.28., B.29., and B.30.).

e. Only a beginning has been made to analyze the internal elements in still pictures and relate these to understanding. Some useful discussions of this problem were made by Black (B.2.), Dawson (B.6.), Olver and Horsby (B.20.), Potter (B.21.), and Ryan and Schwartz (B.22.).

f. Only a start has been made to a consideration of the development of visual literacy in the observer. A recent discussion of this topic was made by Debes (B.7.).

4. Characteristics of Motion Pictures:

a. Extensive research on the effectiveness of the motion picture film in the classroom has been conducted over the years, much of which research compared the film with more conventional modes of instruction. Summaries of the results of such research can be found in the reviews prepared by Allen (C.1.), Greenhill (C.11.), Hoban (C.13.), Hoban van Ormer (C.14.), Lumsdaine (C.18.), Lumsdaine and May (C.19.), Torkelson (C.30), and Wendt and Butts (C.37.).

b. Only within recent years has an attempt been made to study the variable of motion as such and to determine the unique conditions under which motion should be employed for instruction. This is an extremely important problem where instructional systems are being developed to employ a multiplicity of instructional stimuli and where the selection of the optimum mode of visual presentation is imperative. The following current research efforts and theoretical discussions of this problem are suggested for reading: Allen and Weintraub (C.2.), Arnheim (C.2.), Gropper (A.13.), Pryluck (C.25.), Pryluck and Snow (A.28.), Salomon and Snow (A.29.), Siebert and Snow (C.28.), Vetter (C.33.), and Wallach (C.36.).

c. Brandt (C.5.) studied the movement of eyes as observers viewed motion pictures, and Guba and his associates studied the movement of the eyes when television was viewed (D.16. and D.17.).

5. Characteristics of Television:

a. Extensive research on the effectiveness of televised instruction as compared to regular classroom instruction has been conducted and have been summarized by Allen (D.1. and D.2.), Barrow (D.3.), Chu and Schramm (D.8.), Greenhill (D.11.), Hoban (D.19.), Holmes (D.20), Kumata (D.25. and D.26.), Lumsdaine (D.27.), Lumsdaine and May (D.28.), Reid and McLennan (D.31.), Schramm (D.34.), and Torkelson (D.37.).

b. Little research effort has been made to study the elements within the televised presentation that contributes to its effectiveness, and this is one of the current research needs. Studies and discussions that have contributed to this question are those by Desiderato, Kanner and Runyon (D.9.), Gropper and Lumsdaine (D.12, and D.13.), Gryde (D.14.), Guba (D.16. and D.17.), and Runyon, Desiderato and Kanner (D.32).

6. Characteristics of Audio Recordings:

a. Overall research reviews on the effectiveness of audio instruction were made by Allen (E.1.), Lumsdaine (E.13.), Torkelson (E.21.), Travers (E.22.), and Wendt and Butts (E.23.).

b. Representative of some of the specific studies on different aspects of audio instruction were those conducted by Beaird (E.3.) on the audiosimulation of counselor training, Golden (E.10.) on use of audio instruction to improve regional speech patterns, and Popham (E.17. and E.18.) on the use of tape recorded lectures in college instruction.

c. A consideration of the factors involved in listening was given by Duke (E.7. and E.8.), Goyer (E.11.), Silverstone (E.19.), Taylor (E.20.) and Witty (E.24., E.25. and E.26.).

d. Discussion of research and development of the language laboratory and language teaching was given by Asher (E.2.), Carroll (E.5. and E.6.), Hocking (E.12.), and Mathieu (E.14.).

e. Recently, increased attention has been given the use of speeded or compressed speech presented on audio tape, most often for instruction of the blind. Representative of work in this field were the reports by Orr and Others (E.15. and E.16.), and Wood (E.27.).

7. Characteristics of Graphic Representations:

a. The references listed in the Bibliography are largely concerned with the physical characteristics of the more abstract graphic presentations such as charts and graphs. The most comprehensive review of the research was made by Saul and Others (F.9.). The characteristics of print size and readability of projected materials was described by Adams, Rosemier and Sleeman (F.1.) and by Tinker (F.11.).

8. Characteristics of Printed Materials:

a. Discussion of the nature and characteristics of textbooks and printed materials were given by Buckingham (G.1.), Cronbach (G.4.), Davis (G.5.), Olsen (G.9.), Otto and Flournoy (G.10.), Redding (G.11.), and Swanson (G.14.).

b. Summaries of the research on the readability of printed materials were presented by Chall (G.2.) and Klare (G.7.).

9. Characteristics of Programed Instruction:

a. The Bibliography contains a selected list of references dealing with different aspects of programed instruction, and it should serve more as a guide than as an exhaustive coverage of this extensive field. Much research has been conducted during the past few years, and this literature has appeared in a variety of publications. Some specific references will be pointed out in order to suggest the main structure of the field.

b. The following summaries of research on programed instruction will serve as a guide to the literature: Briggs and Angell (H.3.), Briggs and Hamilton (H.4.), Campeau (H.5.), Gilbert (H.20.), Goldstein and Gotkin (H.24.), Gryde (H.29.), Schramm (H.53.), and Silberman (H.56.).

c. Discussions of the role that programed instruction may play were made by Briggs (H.2.), Gotkin and Goldstein (H.25.), Lumsdaine (H.38.), Schutz and Baker (H.55.), and Stolurow (H.62.).

d. Useful books of readings and papers covering a variety of topics in programed instruction were assembled by De Cecco (H.8.), Galanter (H.16.), Glaser (H.23.), Lumsdaine and Glaser (H.39.), and Ofiesh and Meierhenry (H.46.).

e. Pressey presented critiques of programed instruction in two papers (H.49. and H.50.).

10. Characteristics of Computer-Assisted Instruction:

   a. The Bibliography contains a selected list of references dealing with different aspects of computer-assisted instruction, and it should serve more as a guide than as a definitive coverage of a field that is growing rapidly and is being discussed extensively.

   b. The whole issue of Datamation (I.13.), and the papers by Gentile (I.16.) and Stolurow (I.23. and I.24.) present a good overview of the present state of the art of CAI.

11. Characteristics of Individualized Instruction:

   a. Although there is a great deal of overlap in the literature between individualized instruction and programed instruction, there are aspects of individualized instruction that are not subsumed under the more specific procedures of programed instruction. Basic to an understanding of this instructional method are the papers by Bolvin (J.1.), Bolvin and Glaser (J.2.), and Lindvall and Bolvin (J.6.), and the compilation of readings on the subject edited by Henry (J.5.).

12. Characteristics of Multi-Media Systems:

   a. Little research has been done on theoretical attention given to the characteristics and effects of multi-media system development. Some media specialists perceive multi-media systems as combinations of many kinds of instructional materials to accomplish particular teaching objectives, and others as combinations of visual images presented through batteries of projectors usually in a multi-screen or multi-image format.

b. The dial-access system, in which the learner has virtually instant access to a variety of visual and audio inputs (videotape, motion picture film, still picture, audio tape) in individual learning carrels, is increasing in use, and Stewart (K.6.) has treated this transmission mode.

c. Briggs and Others (K.2.) have developed a procedure for designing multi-media instruction to meet various teaching objectives.

13. Characteristics of the Systems Approach to Instruction:

a. The systems approach to instruction, originating in the military's application of system engineering, has received increasing educational attention. The Bibliography contains a selected group of references dealing with the systems approach as it is applied to instruction.

b. The following papers present a useful introduction to this topic: The whole issue of Audiovisual Instruction on "The Systems Approach" (L.1.), Heinich (L.11. and L.12.), Kaufman (L.15.), Persellin (L.20.), Ryans (L.22.), Saettler (L.23.), Smith (L.25.), Stolurow (L.26.) and VanderMeer (L.27.).

14. Characteristics of Simulation and Games:

a. Two types of situations in which the real-life world is simulated have been applied to instruction. One is the simulation proper in which an effort is made to duplicate as realistically as possible the situation that would prevail if the learner were in the actual situation. This is usually a simulation of individual performance. The other type of simulation is the playing of a game, usually in interacting groups, that presents situations that are most likely to occur in the real world. Exact fidelity in the reproduction of the real situation is not necessarily a part of such games.

b. General discussions of simulation are contained in Crawford (M.6.), Davis and Behan (M.7.), Gagné (M.8. and M.9.), Guetzkow (M.10.), and Parker and Downs (M.15.).

c. A more specific discussion of the application of simulation and gaming techniques to education are presented by Abt (M.1.), Boocock and Schild (M.3.), McKay (M.14.), Stoll and Boocock (M.18.), and Vleck (M.19.).

15. Characertistics of Three-Dimensional Materials:

a. Little research or theoretical attention has been given to the instructional values of three-dimensional materials other than that conducted by the Armed Services, and that research has only limited application to non-military classroom instruction because of the complexity of the teaching devices studied. The references in the Bibliography thus have implications largely for military training programs using rather expensive and complex devices.

C. Teaching Suggestions and Approaches:

1. The instructor will probably wish to introduce this unit with readings from Section A of the Bibliography. In particular, the papers by Allen (A.1.), Gerlach (A.8.), Hartman (A.15.), Hsia (A.16.), Gropper (A.10., A.12., and A.13.), May (A.22.), and Salomon and Snow (A.29.) should be read. These readings will give a good fundamental baseline for the consideration of the different media characteristics.
2. Then the instructor will probably wish to make a selection of the different media to consider in more detail. Emphasis should probably be placed on "Still Pictures," "Motion Pictures," "Audio Recordings," and "Programed Instruction." Because the reading load will be heavy, the instructor may divide the class into groups to consider different media and then use a reporting system, together with dittoed handouts by each group, to disseminate knowledge about each area.
3. Some attempt may be made to synthesize the information about the different media characteristics by developing a graphic taxonomy of media traits. Such a class-developed taxonomy may merely characterize the different media along specified dimensions or may attempt to relate the results of research to the cells of the taxonomy.

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UNIT FOUR

MESSAGE DESIGN AND PRODUCTION

A. Objective:

1. The major objective of this instructional unit is the presentation of knowledge about the specific design elements that contribute to message effectiveness and the organization of this knowledge into a form by which it can be applied to instructional materials production.

B. Content to be Taught:

1. The scientific design of instructional media is in a rather primitive state of development, yet increasing attention is being given to the discovery of principles of message design and production. A consideration of this problem cannot be made in isolation but draws heavily from the research and theory covered earlier in Units Two and Three.

2. General Considerations of Message Design and Production:

   a. In order to gain a background for an understanding of the factors that will lead to the optimum design of instructional messages the following readings are suggested: Gropper (A.13.), Lumsdaine (A.21. and A.22.), May (A.26.), Salomon and Snow (A.33.), and Sheffield (A.38.).

b. Briggs (A.3. and A.4.) and Tosti and Ball (A.40.) present models for the selection and design of instructional materials.

c. Introductions to the factors to be considered in designing instructional materials were given by McCoy (A.24.), May (A.25.), Sheffield and Maccoby (A.39.), Twyford (A.44.), and White (A.45.).

d. More specific general design considerations were given by Fleming (A.8.), Greenhill (A.9.), and McCoy (A.24.).

3. Specialized Factors in Media Design and Production:

a. Pre-production or pre-release testing and evaluation of instructional materials has been found to contribute greatly to the ultimate effectiveness of the material. For example, when materials were prepared according to principles of motivational research (Edling, B.2.) or when tailored to the characteristics and interests of the audience (Levonian, B.9.), their effectiveness was improved significantly. The Bibliography presents a number of other techniques for pretesting instructional materials, and general discussion of this process were given by Rose and Van Horn (B.12.), Twyford (B.14. and B.15.), and Zuckerman (B.19.).

b. The phenomenon of motion has been extolled by media specialists, and the motion picture film has consequently been elevated to a dominant position in the hierarchy of instructional media. Yet no extensive research evidence exists to determine under what conditions the depiction of motion is indicated in the design or selection of instructional materials. The references in Section C of the Bibliography relate to this motion variable.

c. Considerable research has been conducted to study the nature of the audio accompaniment to visual presentations. These references are presented in Section D of the Bibliography. Almost all of the references listed are reports of research findings, and, with the exception of Travers' discussion (D.29.), little summarization of these researches has been attempted.

d. One of the most prevailing factors in contributing to learning from instructional media is the furnishing of an opportunity for some kind of active student response. Section E of the Bibliography contains a detailed listing of summaries and research related to this variable. Of particular note are the research summaries and discussion by Allen (E.1.), Hoban and van Ormer (E.4.), Lumsdaine (E.5.), May (E.8.), and Travers (E.10.).

e. Another important variable contributing to improved learning is that of directed attention and response guidance. The research summaries and discussions by Hoban and van Ormer (F.2.), Lumsdaine (F.3.), May (F.4.), and Travers (F.6.) present the major findings from the research and discuss their implications.

f. The third significant production variable contributing to increased learning is that of repetition. Lumsdaine's summary and discussion (G.5.) and the cited research studies treat this variable.

g. Other production factors, such as the rate of development, pacing, sequencing, structure, visual-print relationships, pictorial quality, and color of the visual presentation, are all important elements in media design and production. Detailed listings of both theoretical discussions of these problems and research studies are given in the Bibliography.

C. Teaching Suggestions and Approaches:

1. The instructor will probably wish to introduce this unit with general readings from Section A of the Bibliography. In particular, the papers by Briggs (A.3. and A.4.), Gropper (A.13.), Lumsdaine (A.22.), May (A.26.), Salomon and Snow (A.33.), and Tosti and Ball (A.40.) should be read. Together with the readings from Unit Three on "Media Characteristics and Effects," these readings should furnish a baseline for an understanding of some of the factors involved in message design and production.

2. As was done in the previous unit, the instructor will probably wish to make a selection of different production variables and consider them in more detail. Because the reading load may be heavy, the class could be divided into groups to consider different production variables and use a reporting system to disseminate knowledge about each area.

3. If some synthesis of information about media characteristics had been attempted in Unit Three, an effort might be made to build in these production variables as another dimension of the media taxonomy.

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MESSAGE DESIGN AND PRODUCTION

A. General Considerations:

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UNIT FIVE

MEDIA RELATIONSHIPS TO INSTRUCTIONAL OBJECTIVES AND SUBJECT MATTER CONTENT

A. Objective:

1. The major objective of this instructional unit is the development of an understanding of educational media as they relate to the various instructional objectives being served and the subject matter content being presented.

B. Content to be Taught:

1. A study of the relationships of instructional media effectiveness to either instructional objectives or subject matter content factors has been inadequately studied in the past, but is receiving increased research attention at the present time. The evidence upon which we can develop principles for either the selection of appropriate instructional materials or design and produce them rests largely on the findings and writings of a few individuals and from contributions outside the strict limits of the educational media field.

2. The basic references needed for an understanding of the relationship of educational objectives to media production and use are the taxonomies of educational objectives devised by Bloom and

Others (A.1.) and by Krathwohl, Bloom and Masia (A.9.), Robert Gagné's book on the different types of learning (A.7.) and his other writings on task analysis (A.6. and A.8.) also presented a foundation for the consideration of media-objectives relationships. The attempt by Briggs and Others (A.2.) to develop a procedure for the selection and design of instructional materials in accordance with the objectives being served and types of learning involved is the major systematic effort to deal with this question.

3. The treatment of the relationship of media selection and production to cognitive instructional objectives has been approached in several different ways. Reviews of research were made by Allen (B.1.), Byers (B.5.), Edling (B.7.), Hoban and van Ormer (B.12.), and Travers (B.20.). A consideration of the procedures inherent in task analysis were presented by Miller (B.15. and B.16.), and discussion of the analysis of instructional objectives for the design of instruction were made by Briggs (B.4.), Gagné (B.9.), Mager (B.10.) and Mechner (B.11.). Allen (B.2.), Fattu (B.8.), and Parker and Downs (B.17.) attempted to develop preliminary taxonomies that would permit the matching of media to the instructional objectives being taught.

4. Although a number of studies have been conducted seeking to change the attitudes of learners by means of instructional media, little evidence has accumulated to assist the media specialist or producer in making media choices to accomplish this objective. In short, there are no valid guidlines for

making the decision whether to use one type of medium or another in order to influence attitudinal change. The detailed bibliographic references in Section C of the Bibliography are of particular value in indicating the scope of attention given to the use of media in attitude change.

5. The acquisition of perceptual-motor skills through the use of instructional media has been extensively studied, and there is supportable evidence that media are effective vehicles for presenting models to be followed in learning motor tasks. But, as was the case with affective learning objectives, we have no clear guidelines to follow in selecting the specific types of media for such instruction. Of most direct concern to this problem was the volume of papers edited by A. A. Lumsdaine (Student Response in Programmed Instruction) cited in Section C of Unit One of the Bibliography, individual papers from which are listed in this section.
6. Although instructional media have been used to mediate instruction in a variety of subject matter areas, there is no definitive evidence indicating whether or not such media are more effective in one content area or another.
7. The conclusion that can be drawn from a consideration of media relationships to educational objectives and content is that, although media have been found generally effective, little knowledge exists that would indicate the selection of one type of medium over another.

C. Teaching Suggestions and Approaches:

1. The instructor will probably wish to introduce this unit with general readings from Section A of the Bibliography. In particular, the readings by Briggs and Others (A.2.) and by Gagné (A.6., A.7. and A.8.) should be read as an introduction.
2. As he did with previous units, the instructor may wish to divide the class into groups to analyze and report the research and generalizations from the different sections of the unit.
3. If some synthesis of information about media characteristics and design factors has been attempted in earlier units, an effort could be made to build in these objectives and content variables as another dimension of the media taxonomy. The attempt by Allen (B.2.) could serve as a possible model for such an activity.

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UNIT SIX

MEDIA RELATIONSHIPS TO LEARNER CHARACTERISTICS

A. Objective:

1. The major objective of this instruction unit is the development of an understanding of educational media as they relate to the different characteristics of the learners.

B. Content to be Taught:

1. Increasing attention is being given to the relationships of instructional media selection and production to the characteristics of the learners. The references of value in gaining an introductory familiarity with this area are the papers by Briggs (A.4.), Hoban and van Ormer (A.7.), May (A.9.), and Snow and Salomon (A.15.).
2. The mental ability factor in learning from instructional media has been extensively studied. Although no definitive synthesis of this research has been attempted in recent years, the references listed in Section B of the Bibliography serve as useful summaries.
3. Similarly, the research on age and grade factors is listed in Section C, sex factors in Section D, and social and cultural factors in Section E of the Bibliography.

4. Research and theory relating to those individual factors that result from some kinds of previous training or disposition--such as previous knowledge and training, predispositional, personality, interest, and cognitive style factors--are listed in Sections F through J of the Bibliography. The papers by Hoban and Van Ormer (F.4.), Salomon and Snow (G.23.), Snow and Salomon (G.27.), and Hovland, Janis and Kelley (H.1.) present useful introductions to the consideration of these factors.

5. More specific attention was given to two learner characteristics--that of the handicapped learner (Section K) and the culturally disadvantaged learner (Section L)--as they relate to the development and use of educational media.

6. The conclusion that may be drawn from the research and development on learner characteristics is that these factors are highly important in learning from instructional media and that there is doubtless some pattern of media-learner relationships. Except for some evidence about mental ability, however, this pattern is not yet discernible.

C. Teaching Suggestions and Approaches:

1. The instructor will probably introduce this unit with general readings from Section A of the Bibliography. In particular, the references by Briggs (A.4.), May (A.9.), and Snow and Salomon (A.15.) should be read.

2. As was done with previous units, the instructor may wish to divide the class into groups to analyze and report the research and generalizations from the different sections of the unit.

3. If some synthesis of information about media characteristics, design factors, and instructional objectives has been attempted in earlier units, the learner characteristics studied in this section could be built into the media taxonomy as an additional dimension.

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UNIT SEVEN

CONDITIONS OF INSTRUCTIONAL MEDIA USE

A. Objective:

1. The major objective of this instructional unit is the development of an understanding of the various conditions under which educational media may be used and the particular characteristics of these conditions in relation to different types of media.

B. Content to be Taught:

1. The application of educational media in practical situations, particularly in the classroom, has been extensively studied. The most extensive discussions of these results were made by Allen (A.2.), Hoban and van Ormer (A.10.), Torkelson (A.14.), and Wendt and Butts (A.15.). Chu and Schramm (A.4.) summarized the research on the utilization of classroom television, and May and Lumsdaine (A.12.) discussed some of the implications of film use for instruction based on the studies they conducted.

2. The more specific conditions of classroom use of educational media are listed in detail under a number of headings in Section B of the Bibliography. Again, the references cited in the above paragraph present the best overall summary of the results. In addition, the paper by Allen (B.1.) gives the most complete review of the research relating to the preparation of the class

by means of teacher introduction and classroom preparation; the references by Allen (B.1.), Lumsdaine (B.19.), May (B.26.), and Travers (B.32.) summarize the research and practice on the utilization of student participation techniques; the review by Allen (B.1.) treats class discussion, reviews and summaries; the reviews by Allen (B.1.) and Lumsdaine (B.7.) presents the evidence on the repetitive use instructional materials; and Wendt and Butts (B.10.) review a number of studies related to the use of long series for media for total instruction.

3. The process and problem of translating research findings into practice are discussed at the theoretical level in the four papers listed in Section C of the Bibliography.

C. Teaching Suggestions and Approaches:

1. The instructor will probably introduce this unit with general readings from Section A of the Bibliography. In particular, the papers by Edling (A.6.) and Hoban (A.9.) could be read and discussed, to be followed by a reading of the summary reviews cited in Section B.1. above.
2. As was done with previous units, the instructor may wish to divide the class into groups to analyze and report the research and generalizations from the different sections of the unit.
3. An attempt could be made to synthesize the information about the instructional media as related to factors of use. This class-developed taxonomy might be put in the form of a two-way grid with the factors of use on one axis and the different types of media on another. Robert M. Gagné, in The Conditions of

Learning (A.7.), has prepared a similar grid showing the relationships of media types to the component functions of the instructional situation. His discussion of this relationship, given on pp. 267-297, deserves close attention.

4. Inasmuch as this is the final unit in the course of study, the instructor may wish to present a summary of all the interrelated aspects of theory and research or arrange for student presentation and discussion of the subject.

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